Claims

[c1] *1.*A method for designing a frequency-shaping equalizer to compensate for the frequency response of an existing system, said method comprising:

a.providing a performance block diagram defining one or a plurality of input-output channels for performance tradeoff, said performance block diagram comprising a plurality of blocks representing the dynamics of said equalizer to be designed, the dynamics of said existing system, and the dynamics of one or a plurality of selected performance weighting filters;

b.defining a set of performance tradeoff equalities relating to the frequency response of said input-output channels at a set of selected frequencies, each of said tradeoff equalities being defined at each of said set of selected frequencies;

c.computing the magnitudes of the frequency response of said equalizer at said set of selected frequencies, by solving each of said tradeoff equalities independently;

d.generating the phases of said equalizer at said set of selected frequencies from said magnitudes, said phases and said magnitudes corresponding to the frequency response of a stable system at said set of selected fre-

quencies;

e.providing a set of equalizer coefficients for implementation, said equalizer coefficients being derived from said magnitudes and said phases of said frequency response of said equalizer at said set of selected frequencies.

[c2] *2.*The method of claim 1, wherein each of said performance tradeoff equalities is defined such that the frequency response of said equalizer to be optimized is first constrained to be real or nonnegative in step b and step c, at each of said selected frequencies.

[c3] *3.*The method of claim 1, wherein each of said performance tradeoff equalities relates to a vector norm of the magnitudes of the frequency responses of a system at each of said selected frequencies, said system is related to said input-output channels.

[c4] *4.*The method of claim 1, wherein each of said performance tradeoff equalities relates to a curve or hyper-dimensional surface defined for the magnitudes of the frequency responses of said input-output channels at each of said selected frequencies with intension to approximate a hyper-dimensional rectangle, said hyper-dimensional rectangle is derived from a performance measure of each of said input-output channels for

model-matching;

[c5] 5.The method of claim 1, wherein said phases are generated by signal processing techniques related to complex cepstrum, incorporating said magnitudes.

[c6] 6.The method of claim 1, wherein said equalizer coefficients for implementation are derived from the inverse discrete Fourier transform of said magnitudes and said phases of said frequency response of said equalizer at said set of selected frequencies.

[c7] 7.The method of claim 1, wherein said equalizer coefficients for implementation are derived from curve-fitting said magnitudes and said phases of said frequency response of said equalizer at said set of selected frequencies.

[c8] 8.A method for designing a frequency-shaping equalizer to compensate for the frequency response of an existing system, said method comprising:
a.providing a performance block diagram defining one or a plurality of input-output channels for performance tradeoff, said performance block diagram comprising a plurality of blocks representing the dynamics of said equalizer to be designed, the dynamics of said existing system, and the dynamics of one or a plurality of se-

lected performance weighting filters;

b.defining a set of performance tradeoff optimization problems relating to the frequency response of said input-output channels, at a set of selected frequencies, each of said tradeoff optimization problems being defined at each of said set of selected frequencies;

c.computing the magnitudes of the frequency response of said equalizer at said set of selected frequencies, by solving each of said tradeoff optimization problems independently;

d.generating the phases of said equalizer at said set of selected frequencies from said magnitudes, said phases and said magnitudes corresponding to the frequency response of a stable system at said set of selected frequencies;

e.providing a set of equalizer coefficients for implementation, said equalizer coefficients being derived from said magnitudes and said phases of said frequency response of said equalizer at said set of selected frequencies.

[c9] *9.*The method of claim8, wherein each of said performance tradeoff optimization problems is defined such that the frequency response of said equalizer to be optimized is first constrained to be real or nonnegative in step b and step c, at each of said selected frequencies.

[c10] *10.*The method of claim 8, wherein said phases are generated by signal processing techniques related to complex cepstrum, incorporating said magnitudes.

[c11] *11.*The method of claim 8, wherein said equalizer coefficients for implementation are derived from the inverse discrete Fourier transform of said magnitudes and said phases of said frequency response of said equalizer at said set of selected frequencies.

[c12] *12.*The method of claim 8, wherein said equalizer coefficients for implementation are derived from curve-fitting said magnitudes and said phases of said frequency response of said equalizer at said set of selected frequencies.